

**WHAT IS CLAIMED IS:**

1. Device for open-loop or closed-loop control of an electrical system and a propulsion system of a motor vehicle, with the propulsion system having an internal combustion engine and a transmission with a variable step-up and/or step-down ratio, the electrical system having a vehicle power supply system and at least one battery connected to the vehicle power supply system, and at least one electrical machine being provided which is operable during normal charging mode as a generator for supplying current to the battery and to the vehicle power supply system from the propulsion system, in which case the electrical machine is also drivable by the propulsion system as a generator in a recuperation mode in order to produce a braking torque, and to likewise supply the battery and the vehicle power supply system with current in this case, and in which case the electrical machine is also operable as an electric motor in order to emit torque to the propulsion system,

wherein the device controls the at least one electrical machine in different operating states by different signals, in which case a charging voltage (U-LADE) for the normal charging mode is produced automatically as a voltage reference variable for controlling the electrical machine from signals from vehicle management as a function of the respective requirements for electrical power from the vehicle power supply system and from the battery at any given time;

further wherein the device automatically provides the respective torque demand (MXSG-MAX-MS) at any given time as a torque reference variable for

controlling the electrical machine as a function of the respective requirements, at that time, for a positive or negative torque for the propulsion system, in which case changes in the voltage reference variable (U-LADE) downwards and upwards are limited by predetermined torque limit values (MXSG-MIN-MS, MXSG-MAX-MS) for the electrical machine which define a torque tolerance band, in which further case, changes in the torque reference variable upwards and downwards are limited by predetermined voltage limit values (U-MIN, U-REKUP; or U-MIN, U-REKUP; or U-MIN, U-GRENZ) for the electrical machine, which form a voltage tolerance band,

means for automatic cyclic checking of the reference variables, wherein the electrical machine is controlled automatically by the voltage reference variable (U-LADE), but a change takes place to the torque reference variable for controlling the electrical machine, provided that the tolerance bands are complied with, when and for as long as the torque reference variable demands from the electrical machine a positive or negative torque which is not the same as the predetermined torque on the electrical machine in order to produce the charging voltage (U-LADE).

2. Device according to Claim 1, wherein a unit coordinator is provided in order to use the two or more torque requirements on the propulsion system to form the torque reference variable which results from them.

3. Device according to Claim 1, wherein the device forms the torque reference variable as a function of torque requirements, which torque requirements are defined automatically for torque stabilization of individual vehicle wheels.

4. Device according to Claim 2, wherein the device forms the torque reference variable as a function of torque requirements, which torque requirements are defined automatically for torque stabilization of individual vehicle wheels.

5. Method for open-loop or closed-loop control of an electrical system and a propulsion system of a motor vehicle, with the propulsion system having an internal combustion engine and a transmission with a variable step-up and/or step-down ratio, the electrical system having a vehicle power supply system and at least one battery connected to the vehicle power supply system, and at least one electrical machine being provided which is operable during normal charging mode as a generator for supplying current to the battery and to the vehicle power supply system from the propulsion system, in which case the electrical machine is also drivable by the propulsion system as a generator in a recuperation mode in order to produce a braking torque, and to supply the battery and the vehicle power supply system with current in this case, and in which case the electrical machine is also operable as an electric motor in order to emit torque to the

propulsion system, the method comprising the acts of:

controlling the at least one electrical machine in different operating states by different signals, in which case a charging voltage (U-LADE) for the normal charging mode is produced automatically as a voltage reference variable for controlling the electrical machine from signals from vehicle management as a function of the respective requirements for electrical power from the vehicle power supply system and from the battery at any given time,

automatically providing the respective torque demand (MXSG-MAX-MS) at any given time as a torque reference variable for controlling the electrical machine as a function of the respective requirements, at that time, for a positive or negative torque for the propulsion system, in which case changes in the voltage reference variable (U-LADE) downwards and upwards are limited by predetermined torque limit values (MXSG-MIN-MS, MXSG-MAX-MS) for the electrical machine which define a torque tolerance band, in which further case, changes in the torque reference variable upwards and downwards are limited by predetermined voltage limit values (U-MIN, U-REKUP; or U-MIN, U-REKUP; or U-MIN, U-GRENZ) for the electrical machine, which form a voltage tolerance band,

automatically cyclically checking the reference variables,  
controlling the electrical machine automatically by the voltage reference variable (U-LADE), wherein a change takes place to the torque reference variable for controlling the electrical machine, provided that the tolerance bands

are complied with, when and for as long as the torque reference variable demands from the electrical machine a positive or negative torque which is not the same as the predetermined torque on the electrical machine in order to produce the charging voltage (U-LADE).

6. Method according to Claim 5, wherein a unit coordinator uses the two or more torque requirements on the propulsion system to form the torque reference variable which results from them.

7. Method according to Claim 5, wherein the torque reference variable is also formed as a function of torque requirements which are defined automatically for torque stabilization of individual vehicle wheels.

8. Method according to Claim 6, wherein the torque reference variable is also formed as a function of torque requirements which are defined automatically for torque stabilization of individual vehicle wheels.

9. A method for operating at least one electrical machine for a motor vehicle equipped with a propulsion system, a vehicle power supply system, and at least one battery, the method comprising the acts of:  
coordinating torque requirements for the propulsion system and voltage requirements for the vehicle power supply system and the at least one battery for

the vehicle power supply system, by forming a voltage reference variable for the voltage requirements of the vehicle power supply system and a torque reference variable for the torque requirements of the propulsion system;

limiting the voltage reference variable by upper and lower torque limit values which must not be overshot or undershot in an event of changes to the voltage reference variable; and

limiting the torque reference variable by voltage limit values which must not be overshot or undershot in an event of torque changes; and

utilizing the voltage reference variable and torque reference variable to control the electrical machine in different operating states.